Australian Renewable Energy Policy: All Pain and No Gain

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Executive Summary

RECs are predicated on an erroneous belief they produce some benefit for Australia. In fact they cause great harm to the country and its citizens in multiple ways and at multiple levels, while benefiting private interests, many of them foreign.

It is likely that money flowing from these imposts on the community corrupts government, of which recent and prior history has shown plenty of other examples when government largesse and favours intersect with commercial interests.

The temperature effect from the targeted reduction in Australian CO_2 emissions is so minute it is unmeasurable and certainly impossible for anyone to ever feel. In fact under the RET even this minute reduction in temperatures will not occur since we are simply displacing CO_2 emissions from Australia to other countries, particularly China. Thus the RET is a policy to do harm to Australia, as outlined below, for no benefit.

In addition, the change in Australia's CO_2 emissions has been grossly overstated by applying a reporting convention that has suited the interests of many other countries but has been antagonistic to those of Australia. In reality, there has been almost no change in total CO_2 emissions produced by Australians over the last 30+ years, contrary to what appears in the selective reports of international agencies.

RECs impose multiple costs on Australians:

- Much increased real electricity prices for Australians, in the form of a regressive tax hitting lower income groups most punitively.
- Progressively increasing instability in Australia's electricity system as the scale of non-conventional renewables (solar, wind) grows.
- Reduced competitiveness of Australian industry, driving manufacturing offshore and with it quality jobs and wages, and ultimately weakening Australia's strategic position in the event of conflict.
- An adverse effect on Australia's balance of payments.
- Reduced standard of living for most Australians as a consequence of the combination of weakened international trade position and higher costs for electricity and all products and services dependent on it.
- Large external costs imposed on rural communities upon which windfarms have been inflicted.

In the $6^1/_2$ years from September 2007, Australian consumer electricity prices have more than doubled, increasing by 106%, more than 5 times faster than the CPI. This is much higher than has occurred in major EU countries implementing renewable electricity schemes, except for the UK where the price doubling has taken about 9 years. This change is not wholly due to RECs but it is largely due to changes, of one form or another, introduced by Australian governments, including RECs and the "carbon tax".

Even were most of this change due to other factors, the very size of what has occurred is a powerful reason for Australian governments to not worsen the penalty being imposed on Australian consumers and business.

Perpetuation of RECs will inevitably exacerbate the problem. Analysis of EU data shows that in Europe (where there are some mitigating factors, like hydro and nuclear power) a 1% increase in the share of electricity produced by non-conventional renewables adds 1.7% - 3.2% to consumer electricity prices. On that basis, using RECs to increase the renewables share of Australian electricity production will, in itself, increase local electricity prices by a further 14% - 25% on top of normal inflation factors. This is a price Australians should not have to pay.

The situation Australian governments have inflicted on us is mirrored in the EU, where, as stated in a recent French government report criticizing current EU electricity policy in relation to non-conventional renewables:

> "the rising electricity bills for both households and industrial consumers are cause for concern: on the one hand, it led to a deep increase in the number of fuel poor in Europe and has been limiting households' disposable income. In Germany, the cumulative total that consumers have spent since 2000 only for subsidizing green energy is set to pass €100 bn this year, and is growing by more than €20 bn every year. In Europe, it was higher than €30 bn in 2012. On the other hand, it widened the gap in competitiveness between European industries and their competitors in other parts of the world, especially in the United States."[1]

Given that the RET scheme, and associated RECs, is all pain for no gain:

> ***The Australian government should totally abandon the RET and with it the requirement for RECs.***
>
> ***Should the Australian government persist with the RET, then it should still abandon RECs and subsidise its preferred forms of "renewable energy" directly from consolidated revenue.***
>
> ***Should the government retain the RET and, in one way or another, continue subsidies to windfarm companies, then it should be scrupulous to ensure windfarms are not allowed to impose costs on residents in their vicinity.***

[1] "The Crisis of the European Electricity System: Diagnosis and possible ways forward", Commissariat général à la stratégie et à la prospective, January 2014, p. 10.

The Fallacy of Community Benefit from RECs

Even if one accepts the anthropogenic global warming (AGW) thesis, the temperature effect in that thesis from the targeted reduction in Australian CO_2 emissions is so minute it is unmeasurable and certainly impossible for anyone to feel[2]. So the RET is a policy to do harm to Australia, as discussed below, for no benefit.

In fact, the situation is worse than that. The effect of increased Australian electricity prices achieved by these policies drives industry overseas. When that happens, industry, its consumption of electricity and the associated emission of CO_2 does not stop. It just changes its domicile to a country, such as China, that does not impose such restrictions on itself.

This is not unique to Australia. A French government report on European electricity policy notes:

> "A study from the French Minister in charge of Ecology dated November 2013 shows that, if CO_2 emissions has lowered by 7% on the territory, the consumption of CO_2 has increased by 14.2%, when taking into account the content in CO_2 of imported products.[3]

In other words, the CO_2 emissions directly produced in France fell by 7% but the emissions involved in producing what France consumed, including imports, rose by twice that amount.

Thus, in relation to industry, the RET policy produces no emission reductions. It does, however, deprive Australia of exports (eg aluminium) and of domestic products which have to be replaced with imports (cars, petrol, etc). Thus it reduces Australia's standard of living while adversely affecting Australia's balance of trade.

There is a further reason why this policy is futile from Australia's perspective. It is common for advocates to talk about "global" temperature changes. However, the figure to which they refer is a global average. The forecasts for increased temperatures fall most heavily on the northern hemisphere, where most man-made heat and CO_2 emissions are concentrated, and to a lesser degree on the southern hemisphere[4].

So the minute net change in global temperature due to reductions in Australian CO_2 production involves even more minute effects in the southern hemisphere and Australia. But because of the displacement of some of Australia's emissions to the northern hemisphere, including China, they add to temperature increases in the hemisphere in which most of the "global" increase will occur in any case. So if the aim was to be a "good global citizen", then despite the minute effect of Australia's prior emissions, the policy doesn't actually achieve that since it adds to the emissions and their effect in the northern hemisphere.

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[2] Discussed in detail in the following section.

[3] "The Crisis of the European Electricity System: Diagnosis and possible ways forward", Commissariat général à la stratégie et à la prospective, January 2014, p. 10.

[4] *A Different Perspective of Global Warming*, Bob Tisdale, http://wattsupwiththat.com/2014/05/04/a-different-perspective-of-global-warming/.

Futility of Australia's RET

Bjorn Lomborg reports "If everyone implemented Kyoto, temperatures would drop by the end of the century by a minuscule 0.004C"[5]. As an alternative to the Kyoto agreement, there is the EU's 20-20-20 target which aims to cut EU emissions to 20% below 1990 levels by 2020. This, Lomborg reports would reduce global temperatures at the end of the century by 0.05C.

In 2012, Australia's CO_2 emissions were about 1.2% of the global total, 0.43 BTC (billion tonnes of CO_2)[6] out of a global total of 34.5 BTC, and the EU's share was 11%[7]. So if Australia fully complies with the Kyoto agreement, the reduction in global temperature it will contribute is 0.00005 degrees C (0.004 * 0.012) under the Kyoto agreement or 0.005C if it matches the EU's 20-20-20 target.

Lomborg's estimates are based on accepting the IPCC models of the link between CO_2 emissions and global temperatures. However, those models have consistently over-estimated global temperature increases[8] and global temperatures have not risen for about 17 years despite the continuing increase in atmospheric CO_2. Thus even the minute estimates of temperature contribution from an Australian reduction in CO_2 emissions is drastically overstated.

To make matters worse, between 1997 and 2012, Australia's emissions ostensibly increased by 30% (from 0.33 BTC to 0.43 BTC)[9] but global emissions increased by 41% (from 24.4 BTC to 34.5 BTC)[10]. This included China's emissions increasing by 175% from 3.62 BTC to 9.86 BTC. Between 2000 and 2012, the average annual ***increase*** in China's emissions was 0.525 BTC, ie larger than Australia's total annual emissions. Any reduction in Australia's emissions will be simply overwhelmed by the increases from China and now other emerging economies.

Misleading Information on Australian Emissions

The Australian government's Department of the Environment has published Australia's *National Greenhouse Accounts*, including a *National Inventory by Economic Sector, 2011-12*. It is particularly noteworthy that the latter document, no doubt inadvertently, conceals the fact that Australia's greenhouse gas (GHG) emissions are little different now than in 1989-90.

Total Australian GHG emissions were 555 MTC in 1989-90 and 554.6 MTC in 2011-12 (latest year in the report). Emissions from agriculture, forestry and fishing (AFF) were 230.8 MTC in 1989-90, ie 42% of the total and had fallen to 106.2 MTC in 2011-12, a reduction of 54%. During that period, direct GHG emissions from other economic categories (including electricity generation) rose to some degree or other, except for manufacturing, which fell by 1.1%.

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[5] Lomborg, "Wrong way, go back", *The Australian*, April 08, 2013

[6] But see the caveat to this figure below.

[7] *Trends in global CO2 emissions: 2013* Report by PBL Netherlands Environmental Assessment Agency Institute for Environment and Sustainability (IES) of the European Commission's Joint Research Centre (JRC).

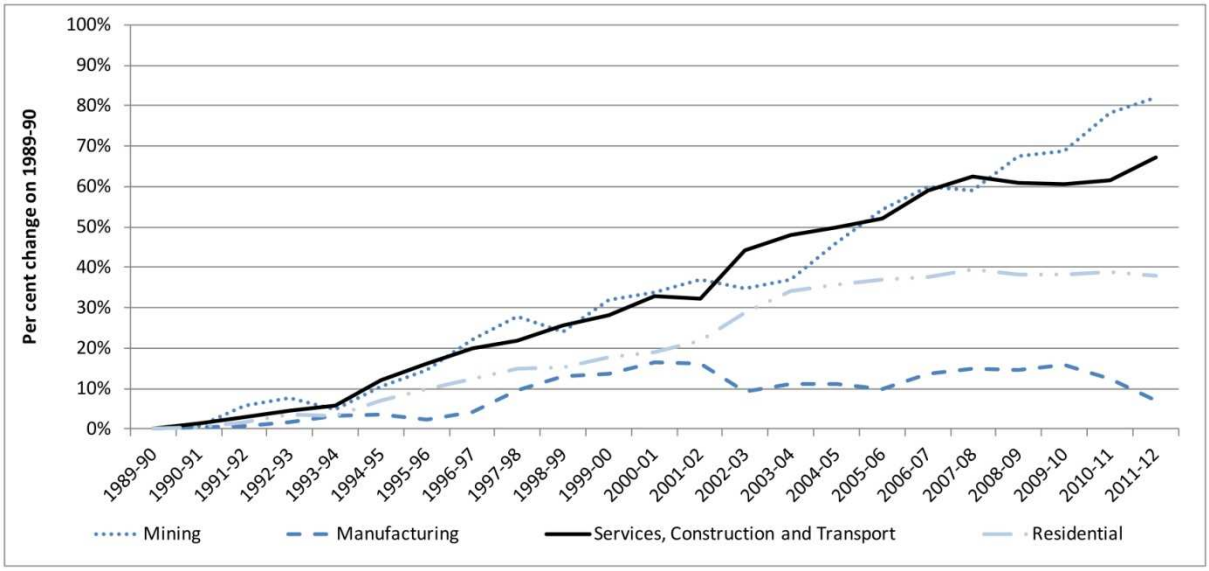
[8] http://quadrant.org.au/opinion/doomed-planet/2014/04/doubling-dud-projections/.

[9] See section below on actual Australian data and apparent omissions from *Trends in global CO2 emissions: 2013* Report.

[10] *Trends in global CO2 emissions: 2013*, Table 2.2.

The report produces a number of graphs to show trends in Australian GHG emissions over time. All of them (see Figure 1, below) omit the category agriculture, forestry and fishing. Consequently all the lines in the graphs show an increase, conveying the clear impression that there has been a large growth in Australia's GHG emissions since 1989-90. Had agriculture, forestry and fishing been included, it would have added to the graphs a line with a very large decline.

Figure 1
Misleading Graph on Australian GHG Emissions



Note that both the 1989-90 (555 MTC) and 2011-12 (554.6 MTC) figures from this Australian government report are higher than the corresponding figures (270 MTC and 430 MTC, respectively) in the Report by PBL Netherlands Environmental Assessment Agency Institute for Environment and Sustainability, indicating that the latter has omitted the agriculture, forestry and fishing component, thus showing increased emissions for Australia rather than fairly constant emissions.

Obviously, were those missing emissions included in the tabulation they would also need to be included for other countries. They are likely to be fairly high for many developing countries. So inclusion would not necessarily raise Australia's share of GHG emissions.

REC Costs

RECs impose multiple costs on the Australian community:

- The most obvious is increasing the price of electricity as the REC cost imposed on retailers is passed on to consumers. This is a regressive tax, since the proportion of income spent on power tends to decline as income rises.
- The reduced competitiveness of Australian industry due to relatively higher power prices tends to drive manufacturing offshore. That in turn adversely affects Australia's balance of payments. This effect has been masked by the boom in Australia's mineral exports, particularly to China. However, the boom has now slowed and will likely slow further as China cannot continue the massive credit explosion of the last few years and as the growth in its exports slows or actually falls. This will adversely affect both the price and volume of Australia's mineral exports, so the exports side of our international trade will take a very big hit while the cost of the RECs erodes non minerals exports and requires more imports to replace destroyed domestic manufacturing.

  This has a negative impact on employment and wages, and on the portfolio of skills available in the Australian economy. It also weakens the country strategically. That will be a huge cost if Australia ever faces another war in its vicinity or there is conflict that impedes its seaborne supply lines. Anyone who imagines those things cannot happen is paying no attention to recent events in Ukraine or China's sabre-rattling in relation to the South China Sea and currently directed at Japan, Vietnam and the Philippines.
- The solar panels, wind turbines and most of the associated gear used in pursuit of the RET policy are all made overseas. Again, they adversely affect Australia's balance of trade without any compensating benefit. The same might be said in relation to equipment for thermal power stations, though Australia already has most of its requirement for them in place. However, such a claim ignores a fundamental problem with solar and wind power, ie its intermittent nature.

  Because of the volatile production from these forms of renewable energy generators, they must be backed up by reliable alternatives, since Australians are not prepared to have their lights, air conditioning, refrigerators, etc go off whenever the wind does not blow or the sun doesn't shine. In Australia that backup generally takes the form of thermal power plants. So renewable energy generators do not displace the need for thermal generators and their capital cost at all. Consequently, the import costs of renewables power plant is additional to, not a substitute for, the power plant imports required in the total absence of these forms of renewable energy in Australia.
- Wind turbines, in particular, impose large external costs on surrounding communities. They adversely affect health, lifestyle and property values of rural residents. Just like the tobacco and asbestos industries before them, the wind industry has fought an active campaign to suppress relevant information and been aided by those areas of government that are invested in promoting "renewable energy".

  It is noteworthy that commercial solar installations do not attract the same strong criticism and persistent local opposition as do windfarms. Unlike the latter, the former do not make noise that harms health and drives people to distraction, making houses unlivable. Nor do they loom over the landscape, to be seen 10kms or more away,

totally inconsistent with the rural characteristics which originally drew people to live in those localities. The bulk of commercial renewable energy installations in Australia are wind turbines, nor solar panels. These are viable only because of the RECs. So the current RET policy is inflicting widespread harm on communities in rural areas.

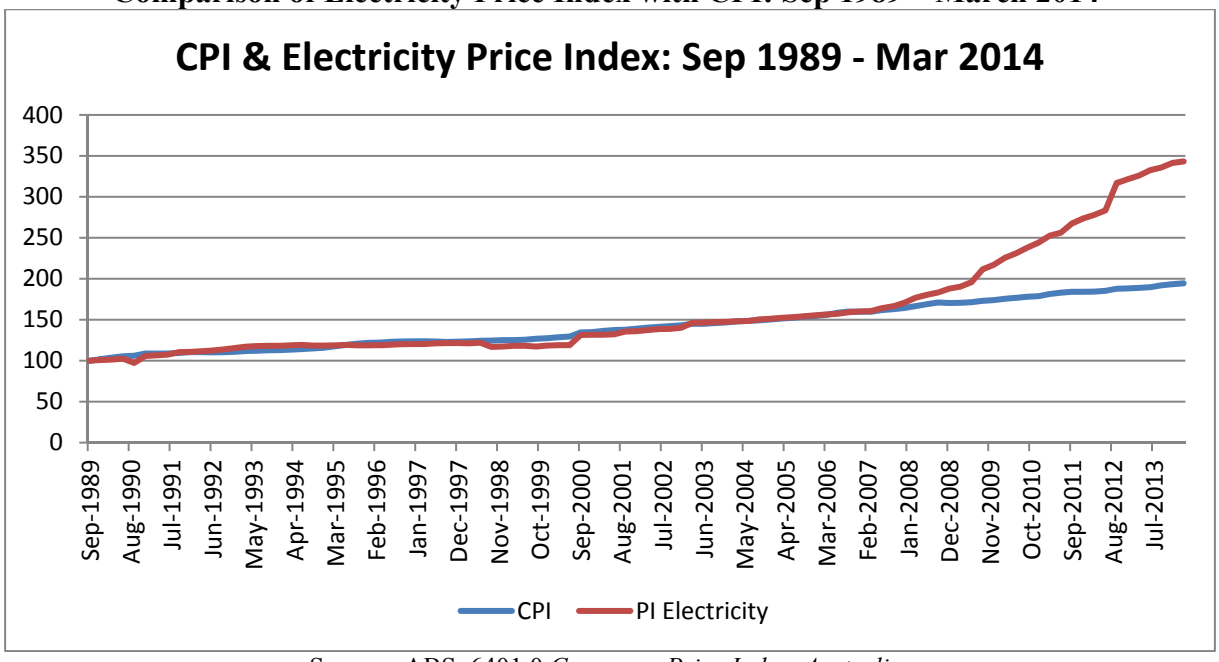
In the first instance, these costs are imposed on individuals who are not party to the transactions establishing wind turbines complexes. Longer term, the losses in assets, health and family cohesion, initially borne by individuals, will make some of them more dependent on the state, thereby throwing some of the burden onto taxpayers more generally.

The Burden of Government-Mandated Electricity Price Increases

In the 18 years from September 1989 to September 2007, Australian electricity prices increased in line with the CPI with virtually no deviation, as shown in Figure 2. But from September 2007, electricity prices exploded.

In the $6^1/_2$ years from September 2007, the overall CPI rose by 19%[11]. In the same period, electricity prices increased by 106%, ie they more than doubled. So electricity prices rose more than 5 times as fast as other prices.

Figure 2
Comparison of Electricity Price Index with CPI: Sep 1989 – March 2014



Source: ABS, 6401.0 *Consumer Price Index, Australia*

The situation is, of course, worse than that. Electricity prices are a component of the CPI. So the 19% increase in the CPI is partly due to the increase in electricity prices directly included in the CPI. But the impact does not end there.

Virtually every aspect of the Australian economy uses electricity. So doubling the electricity price raises the cost, and then the price, of every other component of the CPI. About the only exceptions are imported goods, whose production costs are unaffected by Australian

[11] ABS, *Consumer Price Index, Australia*, Cat 6401.0, March Quarter 2014.

electricity prices. However, if those goods are for consumers or small businesses, they have to be transported, warehoused, passed through wholesalers and retailers to reach the consumer or small business. Each of those intermediate steps uses Australian electricity and thus the electricity adds to the ultimate prices for the end user.

No doubt the RET Review Panel has had the detail of this evaluated. But without going into a fine grained analysis, it is clear that a substantial proportion of the overall CPI increase since September 2007 is due to the more than doubling of electricity prices.

It is also clear from Figure 2 that there is no plateauing in electricity prices. There was a step change from June 2012 to September 2012, with the introduction of the "Carbon Tax" on July1, 2012. However, the pace of increase in electricity prices was much higher than the CPI increase both before and after that step change.

It is also known that under the existing RET the number of RECs required to be purchased by electricity retailers will continue to increase disproportionately to increases in total power consumption. There are suggestions the price of RECs will also rise. Thus there is a fundamental dynamic at work that has been drastically raising electricity prices and that will continue to do so while the REC component of the RET remains.

Analysis of the experience in Europe (see Appendix A for details) shows that for each 1% increase in the share of electricity produced by non-conventional renewables (ie solar and wind), consumer electricity prices increase by between 1.7% and 3.2%.

In 2011-12, 9.4% of Australia's electricity came from renewables[12], with the bulk (5.5%) being hydroelectricity. Presumably the share has increased since then. Assuming it is currently around 12%, that means a further 8% has to come from renewables to reach the government's RET target of 20% in 2020.

Since Australia is not building hydroelectricity power stations, that means it must all come from non-conventional renewables. Applying the European experience, that means we can expect a further increase in electricity prices, from this source alone, of 14% - 25%.

> *This is an ongoing and rising burden on all Australians, damaging the Australian economy and causing a lower standard of living for all Australians than otherwise would be the case, except those who have positioned themselves to capture some of the rents generated by this process.*
>
> *As earlier noted, even were the AGW thesis correct, the RET policy instituted by the Australian government would make no difference to either global or Australian climate. Thus the RECs policy is directly harming the broad mass of Australians for no benefit and should be abolished.*

The doubling of consumer electricity prices in Australia, and the rapid escalation over CPI, is far larger than has occurred in any of the major countries in Europe, as can be seen from the time series graphs in Appendix A. The country that comes closest is the UK, and in that instance the doubling in electricity prices has taken about 9 years, not 6 and a half as in Australia.

[12] *2013 Australian Energy Update*, Bureau of Resources and Energy Economics, Table 8.

This may be a consequence of the haste with which Australia has attempted to impose this new regime, since rapid change in any field usually brings extra cost. It may also reflect the fact that Australian governments have thrown the whole cost of this adventure onto Australian electricity consumers, whereas some European governments have attempted to buffer the consumer to some degree (which is reflected in the relationship then found between renewables share and consumer price).

It also appears likely that government agencies in Australia estimating the price impact of "renewable electricity" have underestimated, for several reasons:

- They tend to compute the isolatable price increase, eg the specific value of RECs purchased by retailers, without taking account of the consequent margin addition likely on the part of the retailer.
- They do not take account of changes and costs that non-conventional renewable operators force onto other parts of the overall electricity system, such as infrastructure changes for distribution, or thermal plants being forced to run less efficiently, or the shutdown of other parts of the system that then affect supply and prices at peak times, all of which ultimately gets wrapped up in prices required to keep the whole system operating.

An example of the latter comes from a recent French government report:

> "The massive integration of renewable energies has induced an oversupply situation, has led to a sharp decrease in prices on the wholesale electricity market (which even turn negative sometimes) and eroded the profitability of gas-fired power plants: in EU-27, 12% of gas-fired capacity could close in the next three years. Yet, those plants are needed to ensure load balancing, as the power grid faces sudden flows of intermittent renewable energies. In the same time, important investments are necessary for some old power plants to be renewed; but, many major utilities are in bad financial shape and will have trouble doing it."[13]

The destabilising effect on the whole electricity grid is captured in this discussion of unintended consequences. Those consequences become more severe, the larger the non-conventional renewables share of electricity production. Obviously loss-making prices for generators cannot continue indefinitely but, as the French report indicates, the effect can drive out some operators who play a key part in coping with the combination of variable demand and variable supply. And the more the non-conventional renewables share of electricity production, the greater the variability of supply and thus uncertainty in the system. In economics in general, the more uncertainty, the higher the return required to justify investments – and that is ultimately paid for by the end users.

To quote further from the French government report cited above:

> "*The European energy system is currently in crisis* [my emphasis]. By adopting the Climate and Energy Package at the end of 2008, the European Union made strong commitments for 2020: a 20% reduction in EU greenhouse gas emissions from 1990 levels, 20% of EU energy consumption produced from renewable resources and a 20% improvement in the EU's energy efficiency. But these targets were based on misguided assumptions. The expected economic growth made the

[13] "The Crisis of the European Electricity System: Diagnosis and possible ways forward", Commissariat général à la stratégie et à la prospective, January 2014, p. 4.

> first commitment a challenging target but it was also supposed to ensure that the deployment of renewable energy sources would be affordable. The expected rise in fossil fuel prices would make renewables profitable and would allow subsidies to be phased out. By paving the way for a climate-friendly economic growth, the European Union had the ambition to become the world leader in renewable energy manufacturing and in the invention of innovative and sustainable ways of life.
>
> For once, the EU strategy was ambitious and comprehensive. But none of its underlying assumptions proved accurate. The financial crisis is partly to blame but so is the US shale gas revolution whose full effects on energy markets have not yet been seen. Besides, the international community is not on track to develop a satisfying response to global warming. The share of electricity generated from coal has been increasing as coal prices went down due to shale gas production (European coal prices fell by 30% between January 2012 and June 2013) and German CO_2 emissions rose in 2012. Moreover, the rise in power of China in the photovoltaic industry has rattled European leadership in renewables, at least partially. Incorrectly adjusted, the EU climate policy has failed to give visibility on carbon price and to provide industrials with a framework conducive to long-term investments."[14]

and

> " yet, electricity prices for households have increased considerably (by 27% between 2008 and 2013). In Germany, they have doubled in ten years and it is now a major political issue there, as well as in Spain."[15]

and

> "security of supply, affordability and sustainability are currently under serious threat."[16]

The harm the current renewables electricity policy is inflicting on European countries is now being mirrored in Australia – but faster.

Disproportionate Impact on Low Income Recipients

The 2009-10 Household Expenditure Survey showed that, at the time, the proportion of income spent on domestic fuel and power by the lowest quintile (4%) was twice that of the highest quintile (2%)[17]. The proportion declined progressively for the intermediate quintiles, being 3.4% for the second lowest quintile.

Since that time (2009-10), the price of electricity has risen by 58%, while the price of gas and other household fuels has risen by 44%. This would increase the proportion of income being spent on fuel and power by each quintile but not materially change the ratio between the highest and lowest quintiles, except to the extent these price increases have caused lower income groups to cut back on power consumption to meet their bills, ie forced them to forego something that was previously part of their accepted standard of living.

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[14] Ibid., p. 3.
[15] Ibid., p. 4.
[16] Ibid., p. 4.
[17] ABS, *Household Expenditure Survey, Australia: Summary of Results, 2009-10*, Cat. no. 6530.0.

To the extent electricity is part of the cost of most other services and products, it seems likely that the effect of electricity prices increases flowing through the prices of other products will impact disproportionately on lower income earners. For instance, there is no obvious reason why the amount of electricity required to ship, refrigerate and distribute an expensive cut of meat should be more than for a cheap cut. Likewise the electricity involved should differ little whether distributing and retailing an expensive bottle of wine or a cheap one, or distributing and selling an expensive automobile or a low priced one.

Thus we should expect Australian electricity costs to be a smaller part of end user prices for higher quality products and services. And since higher quality products and services are more likely to be purchased by high income recipients than low income recipients, that means the latter are more exposed, in the products they purchase, to electricity price increases. Thus, increases in Australian electricity prices will have the biggest inflationary effect on the price of goods and services purchased by low income recipients.

So the effect of RECs falls most heavily on low income recipients, through both their direct purchase of electricity and the Australian electricity component of other goods and services they purchase. The REC is a tax, since it is a government mandated mechanism for compulsorily transferring wealth from one party to another, and where the consumer has no way of avoiding it unless they stop buying electricity and all goods and services with an electricity component. It is as unavoidable as the GST and both are imposed by the federal government. The only difference is that GST funds pass through the government's hands directly before distribution, while REC revenues don't. With RECs, the government has eliminated itself (largely) as the middleman but still determines the beneficiaries of charges levied on consumers.

The current government and its Commission of Audit have made it very clear Australia has been living beyond its means, consuming more than it produces. The government has also made clear its intention to end "the age of entitlement", cutting back on benefits and services it provides. That will directly reduce the discretionary income of a large number of families and/or raise their costs. This will certainly impact on low income recipients.

The government's stated policies in relation to ending "the age of entitlement" may be entirely appropriate. But it is unconscionable to do this in a way that adversely affects low income recipients while simultaneously forcing them to bear a disproportionate share of the cost of funding a government "renewable energy" policy. It is even more egregious a practice given that the "renewable energy" policy provides zero benefit to Australia, or indeed globally, and only acts as a form of entitlement to a class of rent seekers.

> *Any government policy to pursue a RET should be so structured that it does not impact disproportionately on low income recipients. Since the whole point of RECs is to raise electricity prices, which unavoidably has greatest impact on low income recipients, this means RECs should be abolished even if the government retains RET targets.*

Externalised Costs

Wind turbines, in particular, impose heavy costs on many neighbours. The owners of windfarms internalise profits courtesy of the RECs prescribed by the federal government

while externalising large costs on residents and landowners in their vicinity. Through the use of RECs, the Australian government is facilitating institutionalised personal and economic harm to people in rural Australia whose community is invaded by wind turbines.

The harm comes in multiple forms:

- destruction of the amenity and rural lifestyle which was the basis for people buying into those localities;
- health through the combination of audible noise and infrasound and low frequency noise (ILFN); and
- devaluation of properties, largely as a consequence of the two prior effects.

It is understood the RET Review is not directly examining the issue of health effects, on the grounds that it is being dealt with by the NHMRC. Nonetheless, adverse health effects are a personal and economic cost and since the review is supposed to consider benefits and costs associated with the RET and RECs, it should be factored into the evaluation.

Rural lifestyle and amenity are obviously hard to measure and directly evaluate, though pretty well everyone ought to be able to understand that there is some loss of lifestyle when your immediate vicinity becomes populated with large numbers of industrial machines, 150 metres or more high, each with blades sweeping through an area of 3 acres in the sky, causing sun flicker at some times of the day and emitting audible noise as well as low frequency sound that you can feel but not hear. The impact of these effects naturally translates into devaluation of property values.

There has been an ongoing debate about property value impacts, with the wind industry generally claiming there is no effect, or negligible effect. This of course defies logic. The very idea of zoning which is fundamental to land use planning, in both urban and rural locations is based on the idea that some forms of use have detrimental effects on others and so they should be separated and like uses clustered together.

For that reason urban zoning separates industrial areas from residential ones. It separates very high density residential areas from low density residential areas. It separates commercial and entertainment areas from residential areas and generally keeps industrial activity away from commercial zones. Likewise industrial activity is not allowed to be plonked down anywhere in rural zones – except now when the industrial activity consists of massive wind turbines spread over tens of kilometres.

The existence of adverse effects from intrusive land use activities is not a novel idea developed by opponents of wind turbines. There are plenty of analytical studies detailing adverse effects of a large range of such activities[18]. They include, effects of:

- railroad tracks[19], particularly when heavily trafficked by freight trains[20];

[18] Stephen Farber, "Undesirable facilities and property values: a summary of empirical studies", *Ecological Economics* 24 (1998) 1–14.

[19] Note the negative effects of living near heavily trafficked railroad tracks are different from the usually positive effect of living near a station (for the latter, see "The Effect of Rail Transit on Property Values: A Summary of Studies", Research carried out for Project 21439S, Task 7, NEORail II, Cleveland, Ohio, February 27, 2001).

[20] Robert A. Simons & Abdellaziz El Jaouhari, "The effect of freight railroad tracks and train activity on residential property values", *Appraisal Journal*, Summer 2004.

- airport/aircraft noise[21];
- casinos[22];
- mobile phone towers;
- power plants[23];
- electricity transmission lines[24];
- fracking for shale gas[25];
- odour nuisance[26] [27].

The fact that adverse property value effects are found with numerous other intrusive land use activities inconsistent with the prior character of an area does not, in itself, demonstrate that this must be so with wind turbines. Yet the character of wind turbines is so different from the prior use of areas in which they tend to be established that it would be astounding if there were no effect.

There have been a number of studies of wind turbine impacts on property values, mainly overseas, with mixed results. There are a number of reasons why this is likely to be the case:

- Many of the studies are conducted for windfarm proponents, including government, and that creates an automatic pressure to produce the "right" results, to which consultants, whether academics or commercial operators are not immune.
- Not all properties are equally affected. Factors such as nearness, property size and use, come into play.
- Some properties may gain in value if they are actually hosting properties and thus bias upward average sale prices.
- As people in rural communities in Australia near windfarms are well aware, some properties simply become unsaleable except at a huge loss that the owner often cannot bear. So they are effectively removed from the market and thus the loss does not appear in any dataset used for analysis. Naturally these are generally the properties most adversely affected.

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[21] G. Pennington, N. Topham and R. Ward, "Aircraft Noise and Residential Property Values Adjacent to Manchester International Airport", *Journal of Transport Economics and Policy*, January 1990. Ronny Püschel and Christos Evangelinos, "Airport Noise at Düsseldorf International Airport: The Effects of Noise Emissions on the Local Residential Property Market", *Institute for Transport and Economics, Faculty of Transportation Sciences "Friedrich List", Dresden University of Technology*.

[22] "Economic Impact of Casinos on Home Prices: Literature Survey and Issue Analysis", *NAR Research*.

[23] Lucas W. Davis, "The Effect of Power Plants on Local Housing Values and Rents", *The Review of Economics and Statistics*, November 2011, 93 (4), 1391-1402.

[24] Lita Furby, Robin Gregory, Paul Slovic and Baruch Fischhoff, "Electric Power Transmission Lines, Property Values, and Compensation", *Journal of Environmental Management* (1988) 27, 69-83.

[25] Jannette M. Barth, Ph.D., Economist, Pepacton Institute LLC, "Economic Realities of Shale Gas Development in New York State", February 2014, Submitted to accompany verbal testimony presented at Feb 4th Public Forum Hosted by Senator Tony Avella, Albany, New York, titled "Economic Realities of Hydrofracking".

[26] Johan Eyckmans†, Simon De Jaeger‡, Sandra Rousseau, "Hedonic valuation of odor nuisance using field measurements, a case study of an animal waste processing facility in Flanders", *Land Economics*, 2013, vol. 89, issue 1, 53-75.

[27] James N. Webb, "The Effects of Wastewater Spray Irrigation Systems on Adjacent Residential Property Values", US Environmental Protection Agency, Region III, October 1981.

- There is potential confounding with other factors when studies are conducted in fairly high density areas (eg the desire to be close to a nearby beach or work) that are not translatable to low density rural residential areas where windfarms are mainly established in Australia.
- In some situations, where there are strong adverse health or other effects, windfarms may buy properties or offer other compensation but almost invariably requiring the other party to enter into a gagging agreement that keeps knowledge away from the market.

The use of gagging agreements is endemic in the windfarm industry, particularly in relation to prospective hosts who are usually precluded from advising neighbours of their intentions or discussing the details of their commitments. As noted above, the same practice is known to apply when compensation is offered to some affected parties who may have become an irritant to management of particular windfarms.

This practice is harmful to good public policy formation because it removes essential information from the market, the community and from the purview of officials charged with making relevant public policy. The use of gagging orders in relation to any aspect of windfarms should be banned.

> ***In particular, the Australian government should require that as a condition of being authorised to issue RECs, or gain other government subsidies, a windfarm may not impose gagging arrangements as part of any agreement with hosts or affected parties, and that if gagging arrangements have been employed in the process of establishing a windfarm, that windfarm should be ineligible to be authorised to issue RECs or receive any other government subsidy.***

If, as windfarm operators generally claim, there is no adverse effect on nearby property prices, then they should be happy to purchase any such properties put to them at an unimpaired market price. Assuming their assertion is true, the only cost to them would be a transaction cost of buying the property and then on selling at essentially the same price to someone else.

> ***As a condition of being authorised to issue RECs, or receive any other government subsidy, windfarm operators should be required to purchase, at an unimpaired market price[28], any property put to them under the following conditions:***
>
> - ***the property is within 10 kms of one of their turbines;***
> - ***the seller owned the property before the windfarm started operating; and***
> - ***no more than 3 years has elapsed since the windfarm commenced operating.***

[28] An unimpaired market price would be determined by taking the value of the property on purchase, plus any improvements, and adjusting them by the change in value since it was purchased of comparable properties in comparable localities not affected by windfarms or by other intrusive land use (eg mines or CSG operations).

What Should Be Done?

Given that the RET makes no difference to future global temperatures and in particular none to Australian temperatures, we have a government policy that produces no benefit to the country but imposes very substantial and widespread costs. The only beneficiaries are rent seekers, including foreign companies, and any politicians who have aligned themselves with those rent seeks, as well as public servants who jobs are also connected to serving those vested interests.

> ***The Australian government should totally abandon the RET and with it the requirement for RECs.***
>
> ***Should the Australian government persist with the RET, then it should still abandon RECs and subsidise its preferred forms of "renewable energy" directly from consolidated revenue.***

The use of RECs is a regressive tax that hits low income earners hardest and is also destructive of trade-exposed Australian industry. A direct subsidy from consolidated revenue would shift the balance of the tax impost up the income scale and would also remove a punitive negative tariff from Australia's trade-exposed industries. It would, of course, make the subsequent community cost more visible, for which reason it will not be attractive to either the beneficiaries of the RET or politicians supporting it.

If the Australian government continues to pursue the RET, but through direct subsidies, it will continue to have an adverse balance of trade effect due to importation of what is simply redundant power generating equipment. However, it would largely eliminate the adverse balance of trade effect currently caused by the negative tariff on Australia's trade-exposed industries.

No doubt proponents of the existing policy would claim that eliminating RECs would unfairly affect companies that have invested on the basis of a previous Australian government introducing RECs. However, the introduction of RECs impacted adversely on other companies, in all industries, that made investment decisions based on government policy before RECs were mooted, as well as on people who bought property before REC-dependent windfarms were established. The adverse impact on them was not allowed to block the introduction of RECs.

When RECs were introduced, companies had a choice whether to make an investment or not. No such option was available to consumers who were forced to bear the cost of those policies and decisions. So choosing to protect "renewable energy" investors would show a preference to them that has been denied the majority of the Australian economy and society. It would be blatantly unfair.

> ***Should the government retain the RET and, in one way or another, continue subsidies to windfarm companies, then it should be scrupulous to ensure windfarms are not allowed to impose costs on residents in their vicinity. There are four steps that should be taken to achieve this:***

- ***Require rigid compliance with operating conditions imposed by relevant planning authorities, with very strict penalties for any non compliance;***
- ***Review operating conditions for all windfarms and adjust to satisfy the latest health evidence as it emerges over time;***
- ***As a condition for acceptance of subsidies, require all windfarms to offer a property put to all residents already living within 10 kms of their turbines when built, where the put would allow any such resident to sell their property to the windfarm company at an unimpaired market value plus reasonable transaction and relocation costs and the put would exist for three years after becoming effective;***
- ***Prohibit gagging contracts being used with hosts and affected parties.***

It is worth noting one of the recommendations of the previously cited French government report, in relation to the EU electricity policy, is to:

> "reconsider support policies for renewable energies by replacing the feed-in tariffs for technologies which have reached maturity by more market-compatible mechanisms such as feed-in premiums and competitive bidding processes and by stopping the feed-in tariff payment when wholesale prices are negative or when the interconnections are congested. RES producers should also be subject to the same responsibilities and liabilities as conventional energy producers."[29]

[29] "The Crisis of the European Electricity System: Diagnosis and possible ways forward", Commissariat général à la stratégie et à la prospective, January 2014, p. 15.

Appendix A: The Effect of Non-conventional Renewables Electricity Share On Electricity Prices in the EU

The following graphs plot CPI, electricity price index (within CPI), and proportion of electricity generated by non-conventional renewables, ie solar and wind turbines for the period 1996 - 2012[30]. Strictly speaking geothermal might be included in non-conventional renewables but its use is low in Europe except for Iceland, whose use of geothermal for electricity generation has risen from 6% in 1990 to 29% in 2012[31].

The biggest renewable source used in Europe is hydro, which accounted for 12% of electricity generation in the EU in 2012, scarcely changed from 13% in 1990. In comparison, the share of electricity generated by solar and wind has gone from virtually zero in 1998 to 9% in 2012. The use of solar and wind have been driven by subsidies determined by government policies to grow the use of renewables, whereas hydro has a long history as a cost effective power source used because it was competitive with alternatives. For that reason, it is regarded as a conventional renewable, with different economic consequences than the non-conventional renewables of solar and wind.

The biggest source of electricity in the EU is still combustible fuels, accounting for 52% in 2012, only a slight reduction from 56% in 1990. The next biggest source is nuclear, which accounted for 27% in 2012, down from 31% in 1990.

The mix of electricity sources varies greatly among the various EU countries. For instance, many countries do not use nuclear power, while about 75% of France's electricity has been nuclear generated throughout the period 1990 – 2012. Over the same period, Germany's generation of electricity from nuclear power has fallen from 28% of its consumption to 16%. However, almost all of the fall has been from around 2005, having peaked around 30% in the period 1997 – 2000.

Likewise there are large differences in use of hydro-electricity, mainly depending on natural endowments. Virtually all Norway's electricity comes from hydro, as does the bulk of Iceland's. In 2012, locally generated hydro-electricity as a proportion of total consumption was 0% in Denmark, 3% in the UK, 6% in Germany, 9% in Spain, 12% in France, 16% in Italy, 48% in Sweden and 68% in Austria.

Actual consumption share is sometimes different. For instance Denmark, which has no local hydro-electricity generation buys electricity from other countries, including hydro-electricity while selling wind generated electricity to others.

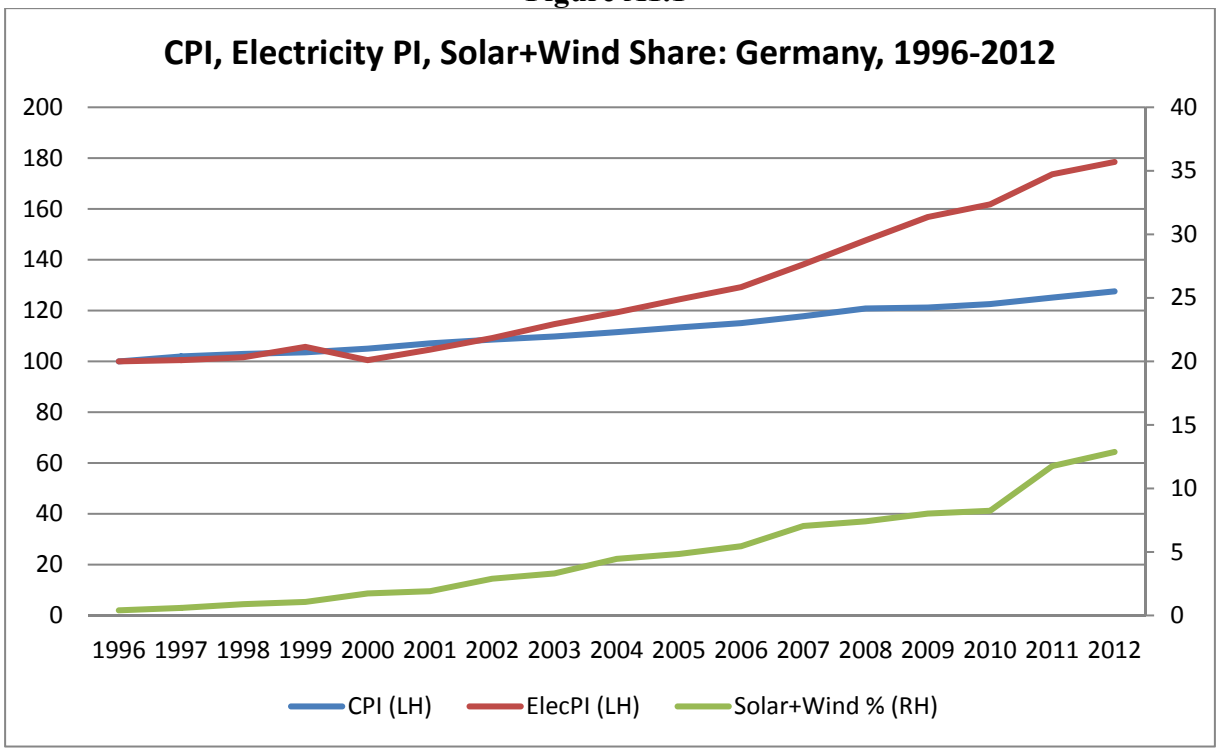
The differences in the mix of electricity sources affect the exposure of national electricity prices to various factors (eg fluctuating price of tradeables such as oil and gas). In addition,

[30] Graphs are for the largest Western European countries, plus Denmark, the biggest user of non-conventional renewables. Price index data from Eurostat database "HICP (2005 = 100) - annual data (average index and rate of change) [prc_hicp_aind]". Period graphed is determined by the period for which common electricity price indices are available.

[31] All figures in this Appendix for share of electricity consumption from various sources have been obtained from tables available from Eurostat database "Supply, transformation, consumption - electricity - annual data [nrg_105a]".

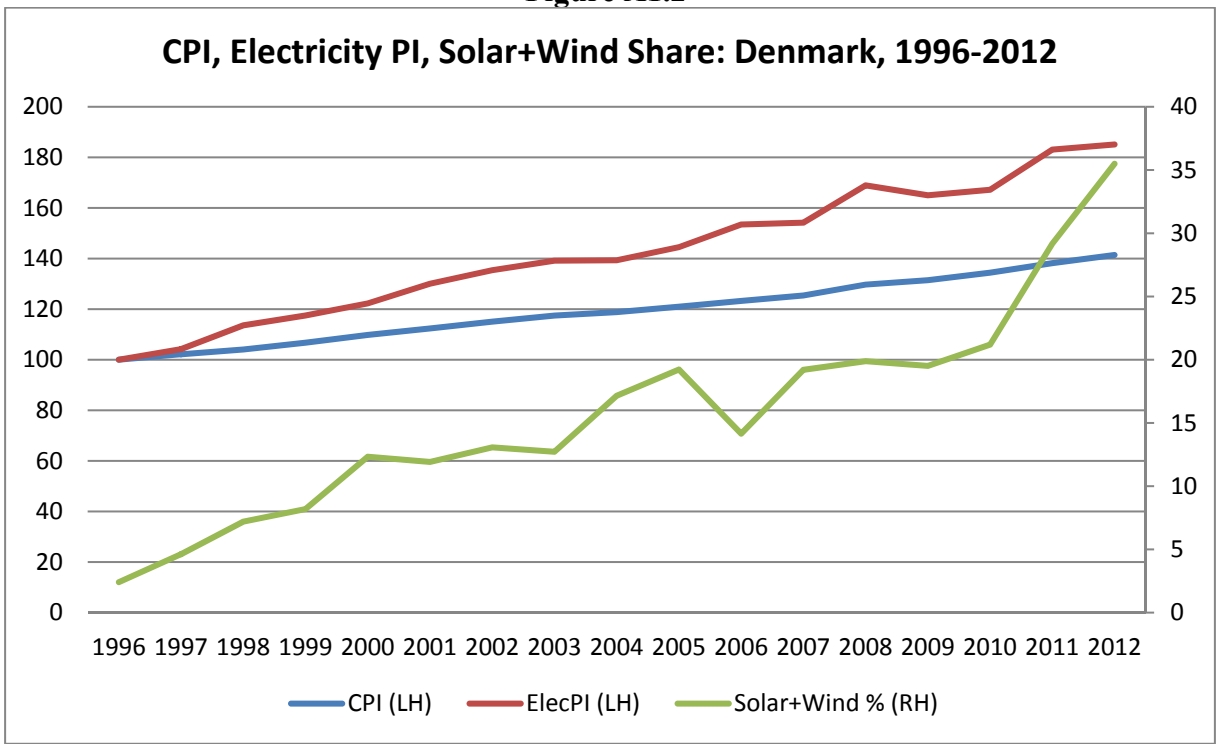
countries differ in government policies affecting electricity prices, such as the extent to which extra costs for renewables are passed on directly in electricity prices or met in some other way.

Figure A1.1



Source: Eurostats

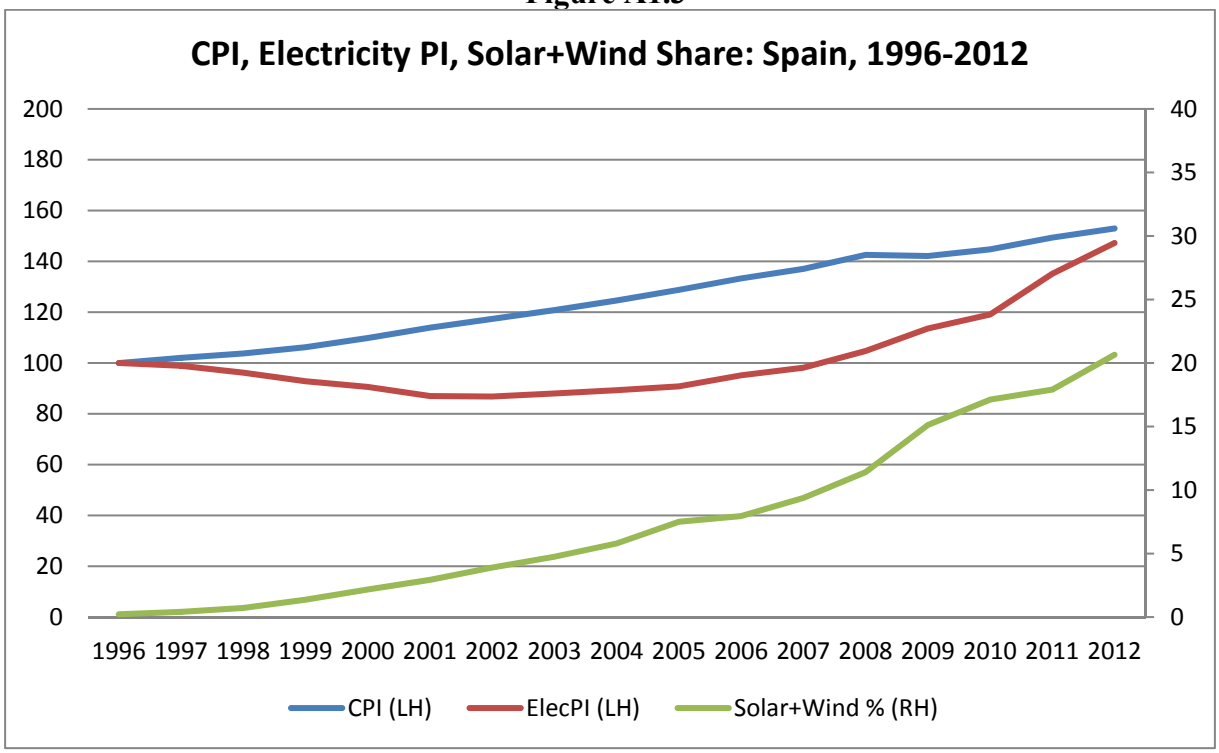
Figure A1.2



Source: Eurostats

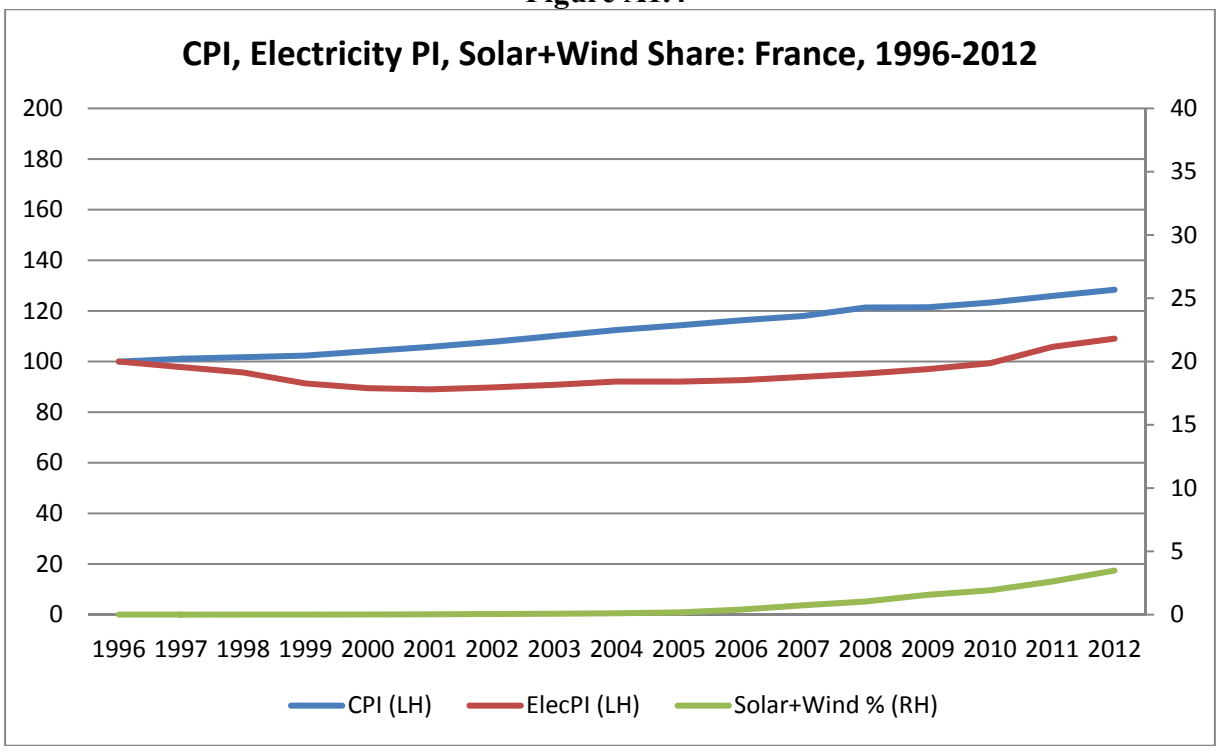
With those caveats, it is clear that in these countries consumer electricity prices have risen much faster than the CPI except in France, Italy and Spain. Even the latter three countries have seen a relative upturn since about 2004. In general the increase in electricity prices relative to CPI has occurred around the time at which the uptake in non-conventional renewables occurred.

Figure A1.3



Source: Eurostats

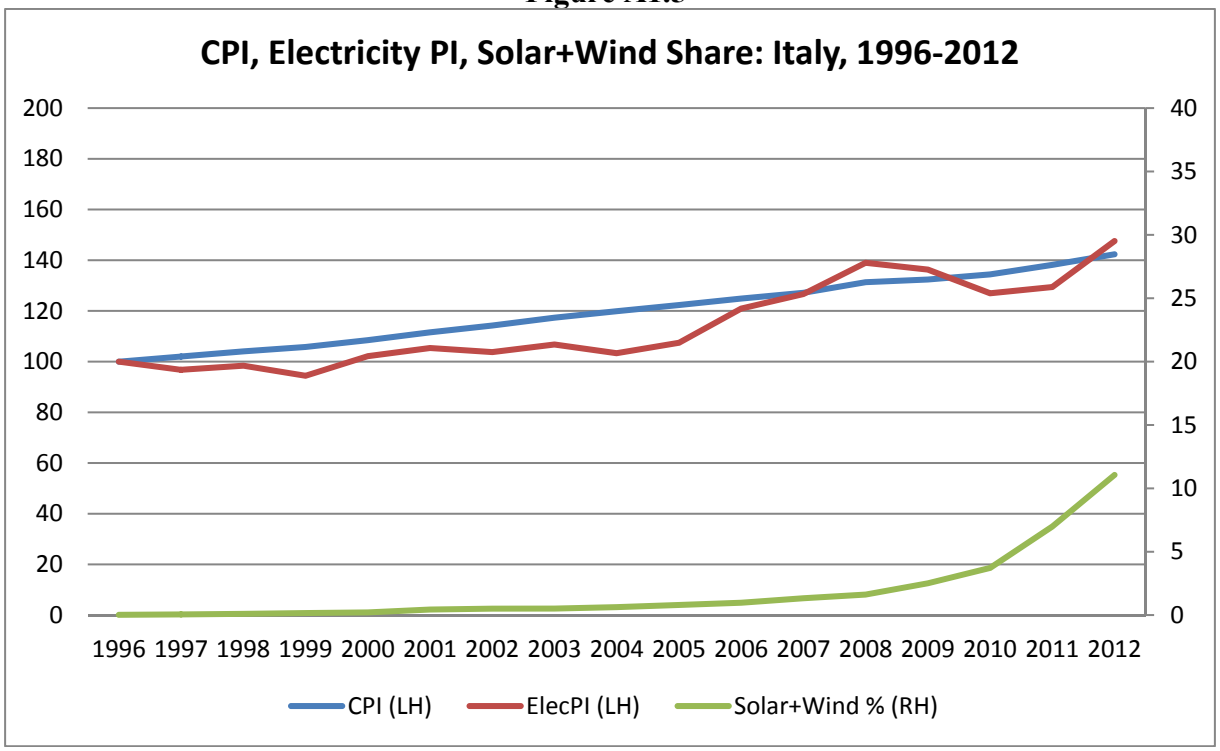
Figure A1.4



Source: Eurostats

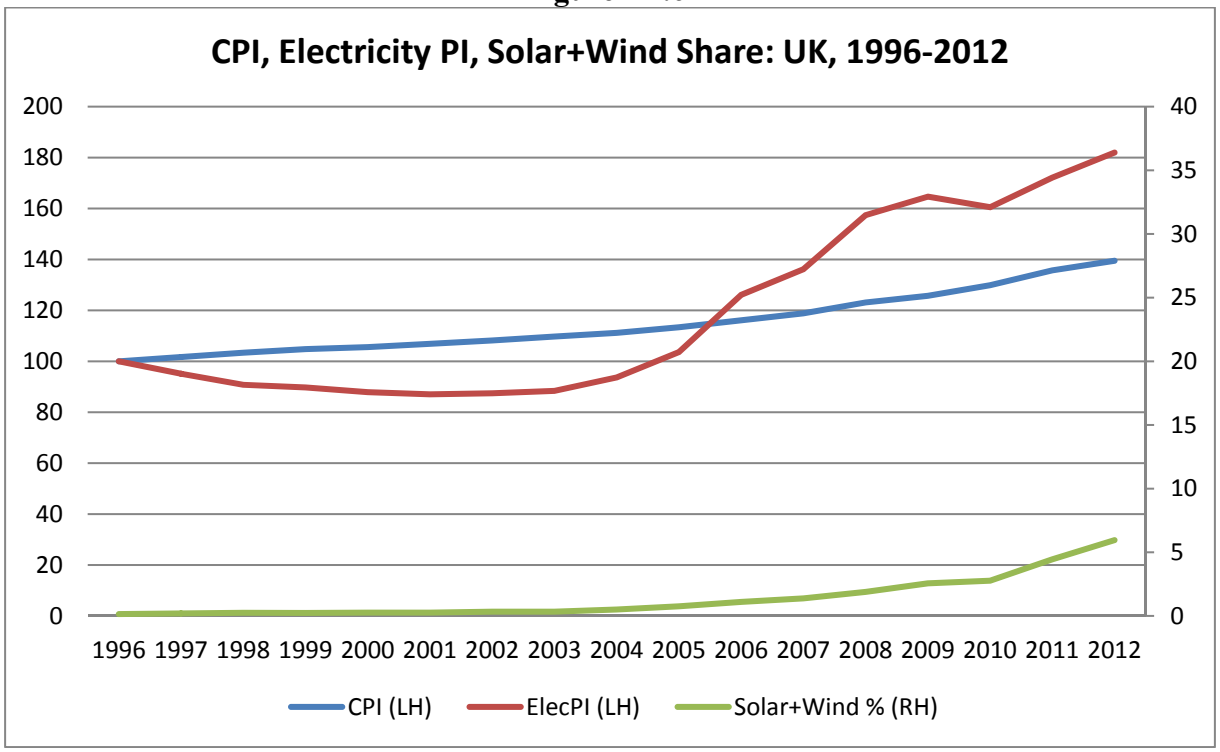
In the case of France, electricity prices actually fell and were fairly static for much of the period. Throughout most of the period almost 90% of France's electricity was from nuclear and hydro sources. Only around 2006 did it start to make some use of non-conventional renewables, and its electricity prices have started to move up since then.

Figure A1.5



Source: Eurostats

Figure A1.6



Source: Eurostats

Spain likewise had a drop in consumer electricity prices in the late nineties, and then started to move up faster than the CPI from the mid 2000s. The Spanish government has had regulated electricity pricing under which the government absorbed much of the actual cost of electricity generation. In so doing, the Spanish government had accumulated a deficit which reached Eur 24 billion in 2012[32] which the Spanish government has attempted to tackle by reducing subsidies in 2010 and again in 2013.

Italy, like the UK, has depended on combustible fuel for about three quarters of its electricity generation. Both had fairly static consumer electricity prices until around 2004 when they started rising faster than the CPI, particularly in the UK. At the same time, both countries had begun to take a significant amount of electricity from non-conventional renewables. Given that natural gas prices had been increasing in the same period (see below), it is difficult to separate the effects without fine detailed analysis.

Figure A2.1

Source: "Natural gas prices" at http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy-2013/review-by-energy-type/natural-gas/natural-gas-prices.html.

EU Electricity Prices Vs Non-Conventional Renewables Electricity Share

The previous section examined time series plots for individual countries. A different approach is to take data for a single year for all EU countries available and plot the actual consumer electricity price[33] in each country against the non-conventional renewables electricity share.

[32] "Energy Subsidies and External Costs", at http://www.world-nuclear.org/info/Economic-Aspects/Energy-Subsidies-and-External-Costs/.

[33] Electricity prices source: Eurostat database "Electricity prices for domestic consumers, from 2007 onwards - bi-annual data [nrg_pc_204], band Band DC : 2 500 kWh < Consumption < 5 000 kWh, including all taxes and levies.

Figure A3.1

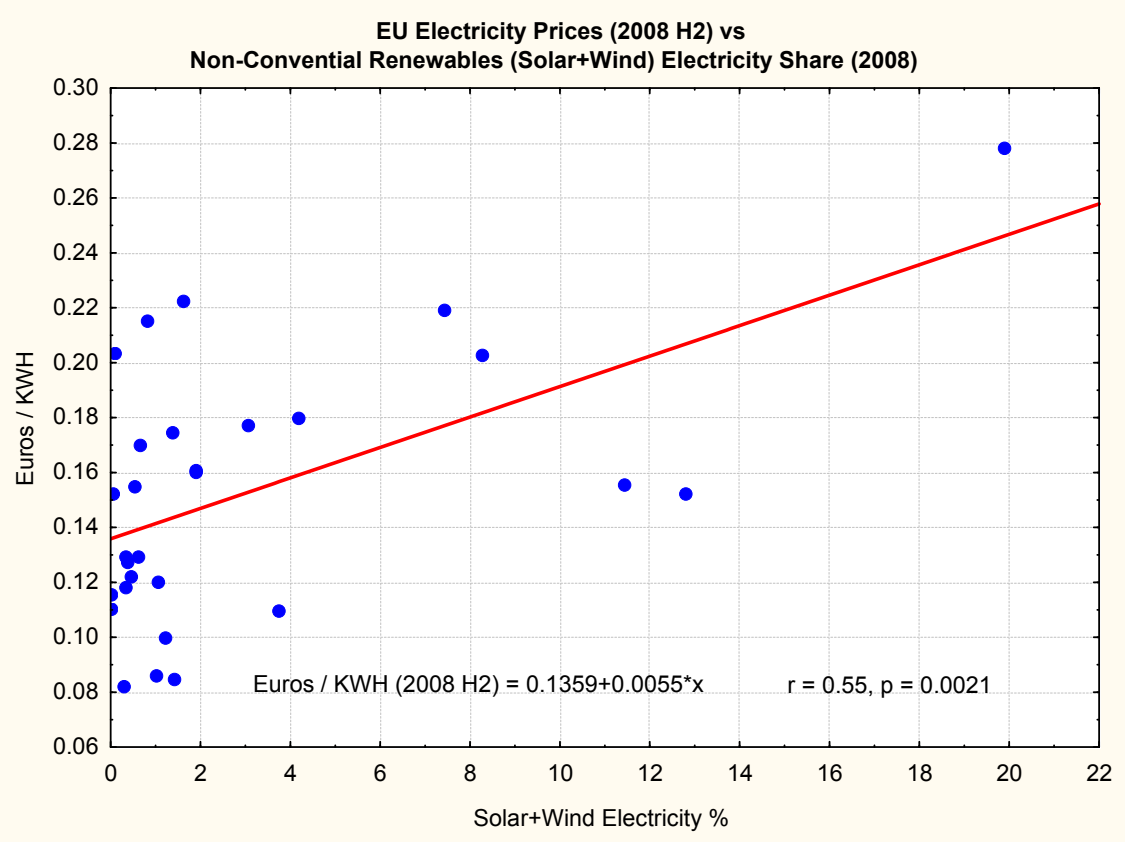


Figure A3.2

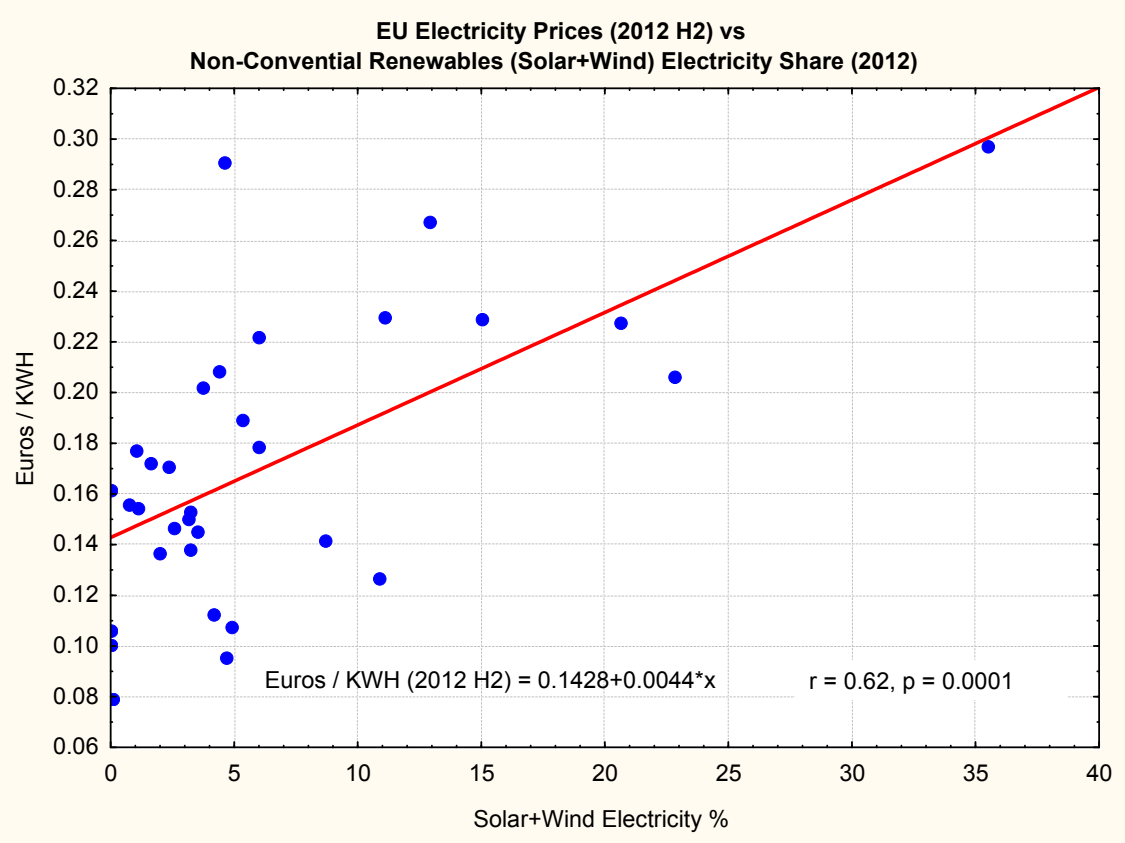
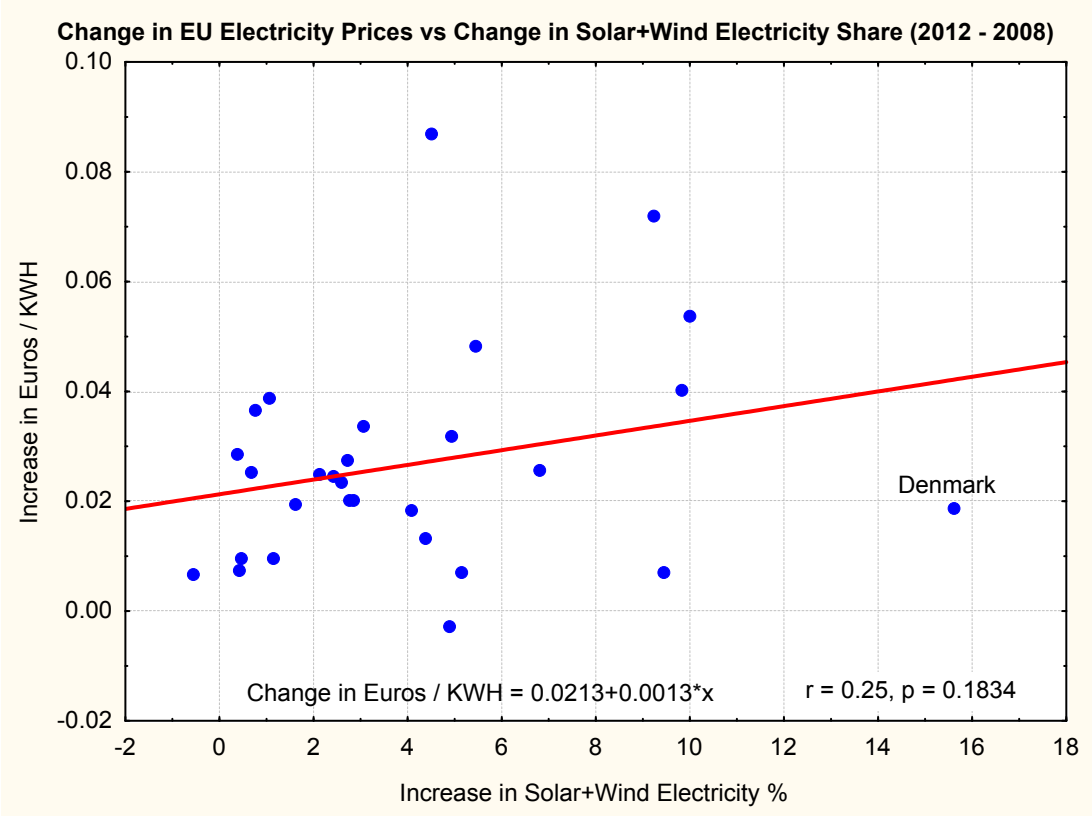


Figure A3.1 above plots the consumer electricity prices in each country in the second half of 2008 against the non-conventional renewables share of electricity consumption in that country in 2008. Each point in the graph represents one country. As the graph shows, in 2008 there was a fairly strong positive correlation (r = 0.55, p value = 0.002) between the two, ie the larger the share of solar and wind generated electricity in the country's consumption, the higher the consumer electricity price per kilowatt hour.

Figure A3.2 shows a similar plot but using data for 2012. It is apparent that there is more dispersion in the data as many countries had increased the proportion of their electricity consumption coming from solar and wind. The positive relationship between the consumer price of electricity and the non-conventional renewables electricity share was even stronger than with the 2008 data. In this case the correlation is 0.62 with p = 0.0001, ie highly statistically significant.

Given the relationships found individually for 2008 and 2012, we might expect that the more a country changes its non-conventional renewables electricity share, the greater the increase in electricity prices. To test this, for each country in the data set the change between 2008 and 2012 was computed for both its non-conventional renewables electricity share and the consumer electricity price in that country.

Figure A3.3



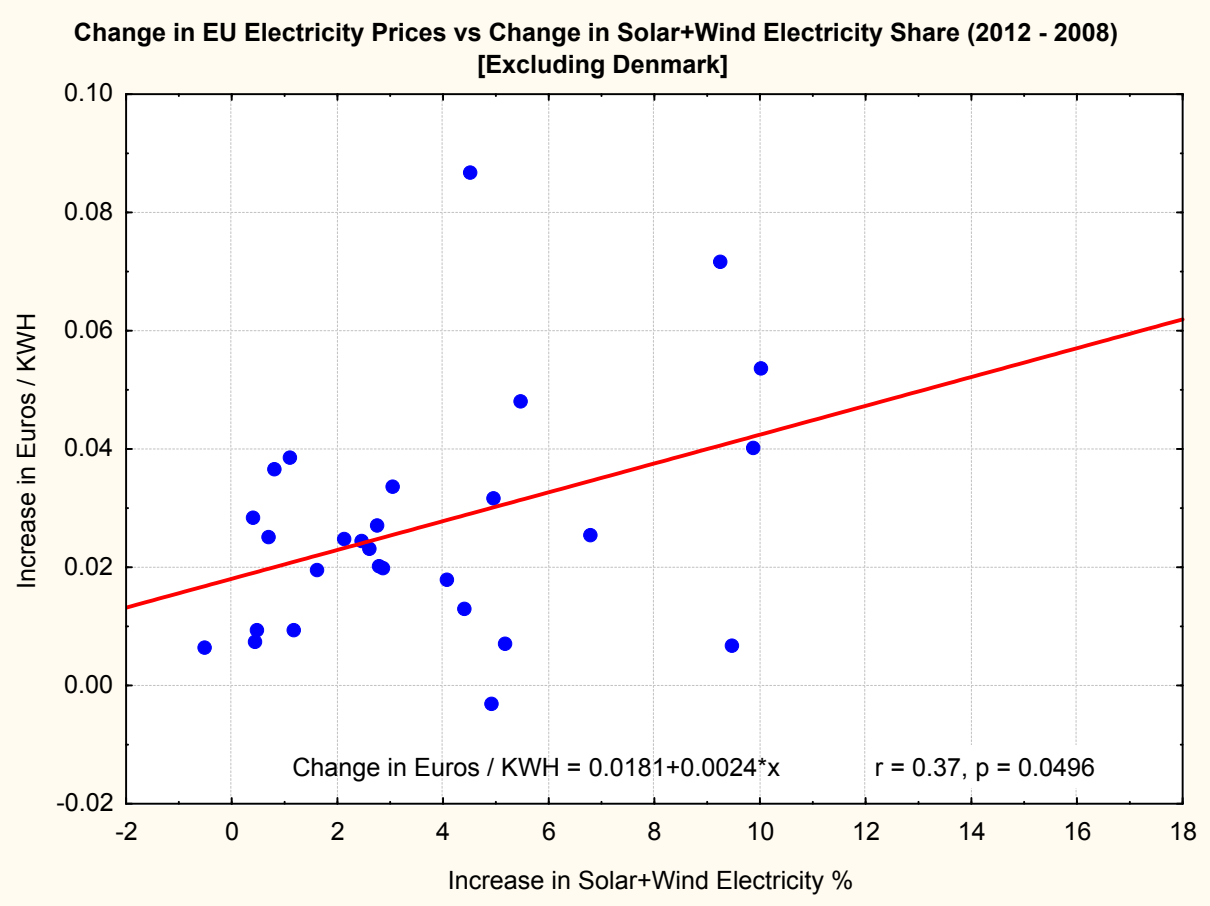
The graph above (Figure A3.3) shows the result. There is indeed a positive correlation between increased non-conventional renewables electricity share and increased electricity price. As a general trend, the greater the increase in non-conventional renewables electricity share, the greater the increase in consumer electricity prices.

However, while there is a visible trend, it is not very strong, with a correlation of 0.25 and a p value of 0.18, which is not statistically significant.

It is obvious from the graph that there is one major outrider, below the trend line. That is Denmark which had by far the largest increase in non-conventional renewables electricity share in the period 2008 – 2012. Denmark certainly also had an increase in electricity prices but well below the trend line.

That raises the question of what happens to the analysis if we exclude this outrider. Figure A3.4 shows the result.

Figure A3.4



As is obvious in the graph above, the relationship is stronger when Denmark is dropped out. The correlation is 0.37 and it is statistically significant at the 0.05 level[34].

It is worth asking what is going on here that may explain Denmark as an outrider. Much of Europe has a linked electricity grid, which allows electricity to be sold from one country to another. Denmark is part of the Nordic power pool. Given that wind power is strong at some times and weak or absent at others, Denmark exports a lot of its wind generated electricity. Conversely, it imports a lot of electricity from other countries, particularly hydro-electricity from Norway and nuclear generated electricity from Sweden, both of which countries have electricity prices well below that of Denmark.

[34] Eliminating Denmark in this case naturally leads to the question of what happens in the cross sectional plots if Denmark is eliminated from them. For both 2008 and 2012, the upward slope remains, though it becomes a bit weaker for 2008. But for 2012, the regression line is virtually unchanged: Euros / KWH (2012 S2) = 0.1424+0.0045*x. The correlation coefficient is somewhat weaker, 0.51 instead of 0.62. The statistical significance (p = 0.003) is still quite strong.

There is debate[35] as to what proportion of Denmark's wind power is exported but there is no disagreement that it exports some wind generated electricity and imports some hydroelectricity and nuclear generated power. It seems unavoidable that as its total wind power capacity becomes a large share of its overall generating capacity, then unless it has a lot of conventional capacity (and Denmark has no hydro) idle when the wind is blowing, it must import an increasing proportion of its electricity when the turbines are not turning. Consequently, unless it is to have a large negative energy balance of payments, it must export a growing amount of electricity when the wind is blowing.

Part of the reason it can do so is that some of its neighbours have pumped hydro, ie they have hydroelectricity capacity and when excess energy is available from other sources, they pump water back up into the dams to be used in generating hydroelectricity when there would otherwise be a shortfall. Those neighbours effectively provide a storage mechanism for excess wind generated electricity from Denmark. This combination of electricity exports and imports undoubtedly has some impact on the cost of electricity consumed in Denmark and is different to the situation of a country whose non-conventional renewables electricity is largely consumed internally and has to be backed up by non-hydro conventional facilities that still have to be paid for.

Interpreting the Results

The time series data for the major European countries, the cross sectional analysis of the EU dataset (both 2008 and 2012), and the analysis of changes between 2008 and 2012 all support the thesis that increasing the non-conventional renewables electricity share increases the consumer electricity price.

We can get some idea of the size of the increase from the equations. Taking the cross-sectional equation for 2012 (excluding Denmark):

*Euros / KWH (2012 H2) = 0.1424+0.0045 * (Solar+Wind Electricity %)*

Which means the expected average electricity price across the EU countries, if there were no non-conventional renewables electricity involved would be 0.1424 Euros per kilowatt hour. For each 1% non-conventional renewables electricity, the expected price increases by 0.0045 Euros per kilowatt hour, ie by 3.16% of the base price. Thus, for a country with a non-conventional renewables electricity share of 10%, the expected price (in 2012) would be 0.1874 Euros per kilowatt hour, 31.6% above the base price. For a country with a 25% share, the expected 2012 consumer electricity price would be 0.2549 Euros per kilowatt hour, ie 79% above the base price.

Taking the analysis depicted in Figure A3.4 for changes between 2008 and 2012, we have the equation (excluding Denmark):

*Change in Euros / KWH = 0.0181+0.0024 * Change in (Solar+Wind Electricity %)*

That means, in the four years from 2008 to 2012, the average consumer electricity price rose by 0.0181 Euros per kilowatt hour without the effect of any increase in the non-conventional renewables electricity share. For each 1% change in the non-conventional renewables

[35] *Wind Energy – The Case of Denmark*, CEPOS (Center for Politiske Studier, Center for Political Studies), September 2009; and *Danish Wind Power – Export and Cost*, CEESA (Coherent Energy and Environmental System Analysis) Research Project (February 2010).

electricity share, it could also be expected to rise by a further 0.0024 Euros. This amounts to about 1.7% of the base price in 2008 and translates into a 17% price increase for a 10% increase in the non-conventional renewables electricity share.

Thus, in the European context, we might reasonably deduce that each 1% increase in the non-conventional renewables electricity share has and will increase the electricity price by an amount between 1.7% and 3.2%.